

REMARKS

Claims 1-11 are now present in this application.

The specification and claim 1 have been amended. Reconsideration of the application, as amended, is respectfully requested.

Claims 1, 5-8 and 10 stand rejected under 35 USC 102(e) as being anticipated by CHEN et al., U.S. Patent 6,716,696. This rejection is respectfully traversed.

Claims 2-4 stand rejected under 35 USC 103 as being unpatentable over CHEN et al. in view of HEO et al., U.S. Patent 6,398,904. This rejection is respectfully traversed.

Claim 9 stands rejected under 35 USC 103 as being unpatentable over CHEN et al. in view of LEE et al., U.S. Patent 6,426,250. This rejection is respectfully traversed.

Claim 11 stands rejected under 35 USC 103 as being unpatentable over CHEN et al. This rejection is respectfully traversed.

It is respectfully submitted that none of the references utilized by the Examiner teaches or suggests providing a mask layer to protect the bottom of a trench during the bottom etching.

Independent claim 1 of the present application recites forming a mask layer to fill the bottom of the trench, etching the portion of the semiconductor substrate of the trench which is not covered by the mask layer, wherein the mask layer protects the bottom of the trench during the etching, and removing the mask layer to form

the bottle-shaped trench. It is therefore clearly that the mask layer serves as an etch barrier or protection layer during etching the substrate, and is not removed until a bottle-shaped trench is completely formed.

The mask layer filled in the trench bottom may either effectively control etching rate to prevent over-etching during wet etching process, keeping a proper depth of the bottle-shaped trench, or avoid awl-shape formation in the susceptible crystal structure of the silicon semiconductor substrate during wet etching process, maintaining the original trench bottom profile. As such, the awl-shape formation in the trench bottom may be avoided.

Nevertheless, CHEN teaches that the semiconductor substrate 100 is etched through the bottom portion I of the trench 108 to form a bottle-shaped trench 116 having an enlarged portion B, after the shield material 112 is completely removed (see FIGS. 4-8 and column 3, lines 34-48, for example). Clearly, the cited reference fails to disclose providing the shield material 112 to protect the bottom portion I of the trench 108 during the bottom etching. In fact, the teaching of CHEN easily results in the awl-shape formation in the trench bottom as described in the background of the specification.

The secondary references utilized by the Examiner fail to overcome the deficiencies of the primary reference to CHEN.

Accordingly, it is respectfully submitted that the references utilized by the Examiner fail to teach or suggest the method of

independent claim 1, as well as its dependent claims. Accordingly, reconsideration and withdrawal of the 35 USC 102(e) and 103 rejections are respectfully requested.

Favorable reconsideration and an early Notice of Allowance are earnestly solicited.

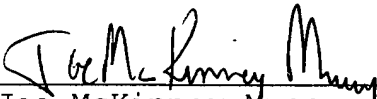
Because the additional prior art cited by the Examiner has been included merely to show the state of the prior art and has not been utilized to reject the claims, no further comments concerning these documents are considered necessary at this time.

In the event that any outstanding matters remain in this application, the Examiner is invited to contact the undersigned at (703) 205-8000 in the Washington, D.C. area.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By   
Joe McKinney Muncy, #32,334

KM/asc  
0941-0873P

P.O. Box 747  
Falls Church, VA 22040-0747  
(703) 205-8000